Chem 130 *Coastline College*
Fall 2016 *Dupon*

Homework Set 5 Solutions

(Distributed 10/5/16; Due on 10/12/16)

Read Chapter 8 in Zumdahl and complete the listed questions from the text: (8E and 7E) Chapter 8: 29, 33, 38, 42, 46, 55, 58, 70; as well as the following problems:

A. Calculate the molar mass for each of the molecules below:

(i) $Al_3(PO_4)_2$
271 g/mole

(ii) $C_{12}H_{22}O_{11}$ (*sucrose*)
342 g/molr

(iii) $Ca(HCO_3)_2$
162 g/mole

(iv) $C_6H_{14}N_2O_2$ (*lysine*)
146 g/mole

B. Complete the table:

Substance	Mass, grams	Molecular or formula mass	# moles	# molecules or formula units
$MgCl_2$	21.7	***95.2***	***0.228***	***1.37×10^{23}***
K_2Se	***881.9***	157.2	***5.61***	***3.38×10^{24}***
$Ba_3(PO_4)_2$	***19.26***	***601.9***	0.032	***1.93×10^{22}***
$C_3H_7O_2N$	0.074	***89***	***8.3×10^{-4}***	***5×10^{20}***
$C_7H_6(NO_2)_2$	***254,860***	***182***	***1400.3***	8.43×10^{26}

C. An organic compound used in food flavoring is 40.67% carbon, 5.08 % hydrogen and 54.25 % oxygen. What is the empirical formula for this compound? If its molecular mass is found to be 118 g/mole, what is its molecular formula?

40.67 g C x 1 mole/12 g = 3.39 moles 1 C
5.08 g H x 1 mole/1 g = 5.08 moles 1.5 H
54.25 g O x 1 mole/16 g = 3.39 moles 1 O empirical formula C2H3O2
empirical formula weight = 62 so 124 = 62 x 2 so molecular formula = C4H6O4

D. Nitrous oxide, or "laughing gas", is prepared by the thermal decomposition of ammonium nitrate:

NH_4NO_3 ----------> N_2O + **2** H_2O ***NOW BALANCED***

Balance the equation and predict how many moles of nitric oxide and moles of water will be prepared from 1 kg of ammonium nitrate

1 kg = 1000 g x 1 mole/80 g = 12.5 moles NH_4NO_3
12.5 moles of NH4NO3 would be expected to produce 12.5 moles of N_2O and 25 moles of H_2O.

<u>Problems from Zumdahl:</u>

Chapter 8:
29. (a) $BaCl_2$: 208.2 g (b) $Al(NO_3)_3$: 213 g (c) $FeCl_2$: 126.75 g
(d) SO_2: 64 g (e) $Ca(C_2H_3O_2)_2$: 158.17 g

33. (a) 41.5 g x 1 mole/95.2 g = 0.436 moles
(b) 135 mg = 0.135 g x 1 mole/29.9 g = 0.00452 moles
(c) 1.21 kg = 1210 g x 1 mole/52 g = 23.2 moles
(d) 62.5 g x 1 mole/98 g = 0.637 moles
(e) 42.7 g x 1 mole/78 g = 0.547 moles
(f) 135 g x 1 mole/34 g = 3.97 moles

38 (a) 77.6 g (b) 177 g (c) 6.09×10^{-3} g
(d) 0.220 g (e) 1.26×10^{3} g (f) 3.78×10^{-2} g

42 (a) 0.0141 moles S (b) 0.0159 moles S
(c) 0.0258 moles S (d) 0.0254 moles S

46. (a)80.34% Zn 19.66% O (b) 58.91 % Na 41.09% S
(c) 41.68% Mg 54.86% O 3.46% H (d) 5.93% H 94.06% O
(e) 95.2% Cu 4.8% H (f) 83% K 17% O

55 (a) NaO (b) $C_4H_3O_2$ (c) $C_{12}H_{12}N_2O_3$
(d) C_2H_3Cl

58. 11.64 g N x 1 mole/14 g = 0.83 moles N
88.36 g Cl x 1 mole/35.5 g = 2.49 moles Cl 2.49/0.83 = 3 NCl3

70. Li_3N